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(54) Abstract Title
Liquid disinfectant composition

(57) An aqueous concentrated liquid disinfectant composition which blooms when added to a larger volume of water comprises

botanical oil constituent such as lavender or peppermint;

a germicide constituent, preferably a germicidal cationic surfactant, and most preferably a quaternary ammonium compound having germicidal properties;

organic solvent constituent;

at least one botanical oil solubilizing surfactant, preferably selected from amine oxides, alkylpolyoxycarboxylates and alkylarylpolyoxycarboxylates;

and further conventional optional constituents including chelating agents, coloring agents, light stabilizers, fragrances, thickening agents, hydrotropes, pH adjusting agents, pH buffers one or more detersive surfactant constituents and the like. The concentrate composition preferably do not include a pine oil.

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IMPROVEMENTS IN OR RELATING TO ORGANIC COMPOSITIONS

The present invention relates to disinfectant compositions. More particularly the present invention relates to concentrated liquid disinfectant compositions which are normally diluted in a larger volume of water to form a working solution therefrom, and which exhibit a blooming effect when diluted.

Blooming is a property exhibited by dilutable compositions such as pine-oil type cleaning compositions which contain a significant amount (generally at least about 5% and more) of pine oil which includes a significant proportion of terpene alcohols. Certain phenolic disinfectant compounds, such as LYSOL disinfectant concentrate (Reckitt & Colman, Inc., Montvale NJ) also exhibit such a blooming property. "Blooming" may be described as the change of the water's appearance from essentially colorless and transparent to that of a milky white or milky yellowish white, cloudy appearance. This effect is also sometimes referred to as the "break". Such blooming is a highly desirable in blooming type cleaning compositions as consumer/end user expectations associate cleaning effectiveness with the extent and degree of this blooming upon formation of a cleaning composition.

While presently commercially available materials have advantageous features, they are not without their attendant shortcomings as well. For example, the use of pine oil, and its pungent characteristic odor is frequently not desired. A further disadvantage is that the use of significant amounts of pine oil in a composition is desirably avoided as the pine oil is know to deposit a sticky residue on hard surfaces, which is particularly undesirable from a consumer standpoint. Also, many such compositions frequently are directed to providing a cleaning effect, and do not provide an appreciable sanitizing effect.

It has now been found that it is now possible to produce certain concentrate compositions utilizing these selected constituents in particular formulations which provide blooming type cleaning compositions in a concentrated liquid form which provide both a germicidal effect and a good blooming effect, and which do not include significant proportions of pine oil. Such blooming is particularly desirable in compositions where the blooming characteristic in an aqueous dilution is long lasting.

Accordingly it is an object of the invention to provide an aqueous concentrated liquid disinfectant composition which blooms when added to a larger volume of water which comprises the following constituents:

a botanical oil constituent;

a germicide constituent, preferably a germicidal cationic surfactant, and most preferably a quaternary ammonium compound having germicidal properties;

an organic solvent constituent;

at least one botanical oil solubilizing surfactant, preferably selected from: amine oxides, alkylpolyoxycarboxylates and alkylarylpolyoxycarboxylates;

optionally but desirably at least one optional constituent selected from: chelating agents, coloring agents, light stabilizers, fragrances, thickening agents, hydrotropes, pH adjusting agents, pH buffers, one or more detersive surfactant constituents particularly non-ionic and amphoteric surfactants, as well as others known the art. The one or more optional constituents are selected to be present, and are included in amounts which do not undesirably affect the overall blooming characteristics of the present inventive compositions.

The compositions according to the invention may also optionally, but in some cases very desirably, also include a biphenyl solvent constituent which aids or imparts a blooming type characteristic to the compositions when added to a larger volume of water.

It is a further object of the invention to provide such a concentrated liquid disinfectant composition wherein the composition exhibits a blooming effect when diluted in a larger volume of water and which provides a germicidal effect in both its concentrated form, and in an aqueous diluted form.

It is a still further object of the invention to provide such a concentrated liquid disinfectant composition which in a diluted form provides disinfection of surfaces wherein the presence of gram positive type pathogenic bacteria such as *Staphylococcus aureus*, and/or the presence of gram negative type pathogenic bacteria such as *Salmonella choleraesuis* and/or *Pseudomonas aeruginosa* is suspected.

As an essential constituent in the concentrate compositions according to the present invention there are present one or more botanical oils, sometimes also referred to as "essential oils" which are useful in providing a blooming effect. By way of non-limiting example these include one or more of: Anethole 20/21 natural, Aniseed oil china star, Aniseed oil globe brand, Balsam (Peru), Basil oil (India), Black pepper oil, Black pepper oleoresin 40/20, Bois de Rose (Brazil) FOB, Borneol Flakes (China), Camphor oil, White, Camphor powder synthetic technical, Canaga oil (Java), Cardamom oil, Cassia oil (China), Cedarwood oil (China) BP, Cinnamon bark oil, Cinnamon leaf oil, Citronella oil, Clove bud oil, Clove leaf, Coriander (Russia), Coumarin 69°C (China), Cyclamen Aldehyde, Diphenyl oxide, Ethyl vanilin, Eucalyptol, Eucalyptus oil, Eucalyptus citriodora, Fennel oil, Geranium oil, Ginger oil, Ginger oleoresin (India), White grapefruit oil, Guaiacwood oil, Gurjun balsam, Heliotropin, Isobornyl acetate, Isolongifolene, Juniper berry oil, L-methhyl acetate, Lavender oil, Lemon oil, Lemongrass oil, Lime oil distilled, Litsea Cubeba oil, Longifolene, Menthol crystals, Methyl cedryl ketone, Methyl chavicol, Methyl salicylate, Musk ambrette, Musk ketone, Musk xylol, Nutmeg oil, Orange oil, Patchouli oil, Peppermint oil, Phenyl ethyl alcohol, Pimento berry oil, Pimento leaf oil, Rosalin, Sandalwood oil, Sandenol, Sage oil, Clary sage, Sassafras oil, Spearmint oil, Spike lavender, Tagetes, Tea tree oil, Vanilin, Vetyver oil (Java), Wintergreen. Each of these botanical oils is commercially available. As noted previously, the inventive compositions do not include pine oil which is known to the prior art to provide blooming effects.

Particularly preferred oils include those which are exemplified by the examples, following, and include: peppermint oil, and lavender oil.

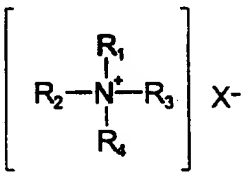
These botanical oils may be commercially obtained from a variety of suppliers including: Givadan Roure Corp. (Clifton, NJ); Berje Inc. (Bloomfield, NJ); BBA Aroma Chemical Div. of Union Camp Corp. (Wayne, NJ); Firmenich Inc. (Plainsboro NJ); Quest International Fragrances Inc. (Mt. Olive Township, NJ); Robertet Fragrances Inc. (Oakland, NJ).

These botanical oils may be present in the compositions in any amounts which are effective in providing a desirable blooming effect. Generally amounts from as little as 0.001%wt. to amounts of 20%wt. are useful, based on the total weight of the concentrated liquid disinfectant composition. More preferably these oils are present in amounts of from 0.01 - 15%wt., still more preferably 0.1 - 15%wt., and most preferably in amounts of from 1-10%wt. Of course, more a plurality of these oils may be used.

The concentrate compositions according to the invention include a germicide constituent which is found to provide an antibacterial or antimicrobial function. Desirably the germicide constituent is at least one cationic surfactant which is found to provide a broad antibacterial or sanitizing function. Any cationic surfactant which satisfies these requirements may be used and are considered to be within the scope of the present invention, and mixtures of two or more cationic surface active agents, *viz.*, cationic surfactants may also be used.

In particularly preferred embodiments the concentrated disinfecting and cleaning compositions provided herein provide good cleaning, effective sanitization of surfaces particularly hard surfaces, and low irritancy to the consumer, especially low ocular irritation.

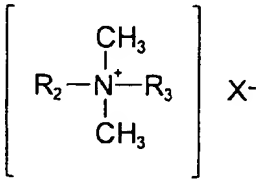
The compositions of the invention include a disinfecting effective amount of a quaternary ammonium compound having germicidal properties. Particularly useful quaternary ammonium compounds and salts thereof include quaternary ammonium germicides which may be characterized by the general structural formula:



where at least one of R_1, R_2, R_3 and R_4 is a hydrophobic, aliphatic, aryl aliphatic or aliphatic aryl radical of from 6 to 26 carbon atoms, and the entire cation portion of the molecule has a molecular weight of at least 165. The hydrophobic radicals may be long-chain alkyl, long-chain alkoxy aryl, long-chain alkyl aryl, halogen-substituted long-chain alkyl aryl, long-chain alkyl phenoxy alkyl, aryl alkyl, etc. The remaining radicals on the nitrogen atoms other than the hydrophobic radicals are substituents of a hydrocarbon structure usually containing a total of no more than 12 carbon atoms. The radicals R_1, R_2, R_3 and R_4 may be straight chained or may be branched, but are preferably straight chained, and may include one or more amide or ester linkages. The radical X may be any salt-forming anionic radical.

Exemplary quaternary ammonium salts within the above description include the alkyl ammonium halides such as cetyl trimethyl ammonium bromide, alkyl aryl ammonium halides such as octadecyl dimethyl benzyl ammonium bromide, N-alkyl pyridinium halides such as N-cetyl pyridinium bromide, and the like. Other suitable types of quaternary ammonium salts include those in which the molecule contains either amide or ester linkages such as octyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, N-(laurylcocoaminoformylmethyl)-pyridinium chloride, and the like. Other very effective types of quaternary ammonium compounds which are useful as germicides include those in which the hydrophobic radical is characterized by a substituted aromatic nucleus as in the case of lauryloxyphenyltrimethyl ammonium chloride, cetylaminophenyltrimethyl ammonium methosulfate, dodecylphenyltrimethyl ammonium methosulfate, dodecylbenzyltrimethyl ammonium chloride, chlorinated dodecylbenzyltrimethyl ammonium chloride, and the like.

Preferred quaternary ammonium compounds which act as germicides and which are be found useful in the practice of the present invention include those which have the structural formula:



wherein R_2 and R_3 are the same or different C_8-C_{12}alkyl, or R_2 is $C_{12\text{-}16}$alkyl, $C_{8\text{-}18}$alkylethoxy, $C_{8\text{-}18}$alkylphenolethoxy and R_3 is benzyl, and X is a halide, for example chloride, bromide or iodide, a succinate, or may be methosulfate. The alkyl groups recited in R_2 and R_3 may be straight chained or branched, but are preferably substantially linear.

Particularly useful quaternary germicides include compositions which include a single quaternary, as well as mixtures of two or more different quaternaries. Particularly useful quaternary germicides include those commercially available under the BARDAC, BTC, BARQUAT, HYAMINE, tradenames (ex., Lonza AG, Stepan Co., or other commercial sources). It is contemplated that mixtures of two or more of these may also be used. The preferred germicidal cationic surfactant(s) may be present in the concentrated liquid disinfectant compositions in amounts of from about 0.001 % by weight to up to about 15% by weight, preferably about 0.01-8% by weight, most preferably in amount of between 0.5-6 % by weight.

A further constituent according to the invention is an organic solvent which is present in addition to the botanical oil which is itself known to be an organic solvent and assists in improves the dispersability and/or miscibility of the botanical oil in water. The organic solvent may also improve the miscibility of further constituents according to the present invention, including any water insoluble or poorly soluble constituents. Many useful organic solvents which are known to be useful in dispersing botanical oil in

water may be used; virtually any may be used as long as it does not undesirably disrupt the favorable characteristics of the invention, especially the blooming characteristic. Mixtures of two or more organic solvents may also be used as the organic solvent constituent.

Exemplary useful organic solvents are those which are at least partially water-miscible such as alcohols, water-miscible ethers (e.g. diethylene glycol diethylether, diethylene glycol dimethylether, propylene glycol dimethylether), water-miscible glycol ether (e.g. propylene glycol monomethylether, propylene glycol mono ethylether, propylene glycol monopropylether, propylene glycol monobutylether, ethylene glycol monobutylether, dipropylene glycol monomethylether, diethyleneglycol monobutylether), lower esters of monoalkylethers of ethyleneglycol or propylene glycol (e.g. propylene glycol monomethyl ether acetate) all commercially available from Union Carbide, Dow Chemicals or Hoescht. Mixtures of organic solvents can also be used.

Particularly useful organic solvents include glycols such as alkylene glycols such as propylene glycol, and glycol ethers. Examples of such glycol ethers include those having the general structure R'-O-R''-OH, wherein R' is an alkoxy of 1 to 20 carbon atoms, or aryloxy of at least 6 carbon atoms, and R'' is an ether condensate of propylene glycol and/or ethylene glycol having from one to ten glycol monomer units. Examples of such useful glycol ethers include propylene glycol methyl ether, dipropylene glycol methyl ether, tripropylene glycol methyl ether, propylene glycol isobutyl ether, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol butyl ether, diethylene glycol phenyl ether, propylene glycol phenol ether, and mixtures thereof. Preferred are ethylene glycol n-butyl ether, diethylene glycol n-butyl ether, propylene glycol and mixtures thereof. Most preferably, the organic solvent constituent includes propylene glycol as the sole glycol or glycol ether present in the composition. Such glycol ethers recited above are presently commercially available from a number of sources including in the DOWANOL™ glycol ether from The Dow Chemical Company, Midland MI (USA).

Further particularly useful organic solvents monohydric (straight chained or branched) primary, secondary or tertiary lower aliphatic alcohols, especially C_1-C_6 aliphatic primary and secondary alcohols, of which isopropanol is particularly preferred.

It has generally been found the addition of only a minimum effective amount which is found to be effective in dispersing or solubilizing the botanical oil constituent and any other aqueous insoluble or poorly soluble constituents in the concentrate compositions is desirably used. Such is due to desire to reduce the amount of volatile organic constituents in the concentrate compositions of the invention, which volatile organic constituents are desirably minimized from an environmental standpoint. The present inventors have found that inclusion of the organic solvent constituent in amounts of about 0.001% by weight to about 50% by weight have been found to be effective to solubilize the botanical oil, as well as in solubilizing other less water soluble constituents present in the concentrate compositions of the invention.

Preferably, the organic solvent constituent is present in amounts of from 0.1 - 40% by weight, and most preferably from about 0.1 - 35% by weight.

Additionally the inventor has found the according to certain preferred embodiments the organic solvent constituent, comprises, and in certain especially preferred embodiments consist essentially of, an alkylene glycol such as propylene glycol, with a monohydric lower aliphatic alcohol such as a C_1-C_6 aliphatic primary or C_1-C_6 aliphatic secondary alcohol, especially isopropyl alcohol, and further a higher aliphatic primary or secondary alcohol such as a C_8-C_{14} alcohol, especially lauryl alcohol. Desirably, the alkylene glycol constituent is equal in an amount at least equal to the total amount of both the C_1-C_6 alcohol and the C_8-C_{14} alcohol.

The organic solvent constituent may be present in the concentrated liquid disinfectant compositions in amounts of from about 0.001 % by weight to up to about 50% by weight, preferably about 0.1-40% by weight, most preferably in amount of between 0.1-35% by weight. Of course a mixture of organic solvents may be used.

The concentrate compositions of the invention further comprise at least one botanical oil solubilizing surfactant. Particularly useful as the botanical oil solubilizing surfactant are nonionic surfactant compositions based on amine oxides.

One general class of useful amine oxides include alkyl di (lower alkyl) amine oxides in which the alkyl group has about 10-20, and preferably 12-16 carbon atoms, and can be straight or branched chain, saturated or unsaturated. The lower alkyl groups include between 1 and 7 carbon atoms. Examples include lauryl, dimethyl amine oxide, myristyl dimethyl amine oxide, and those in which the alkyl group is a mixture of different amine oxide, dimethyl cocoamine oxide, dimethyl (hydrogenated tallow) amine oxide, and myristyl/palmityl dimethyl amine oxide.

A further class of useful amine oxides include alkyl di (hydroxy lower alkyl) amine oxides in which the alkyl group has about 10-20, and preferably 12-16 carbon atoms, and can be straight or branched chain, saturated or unsaturated. Examples are bis(2-hydroxyethyl) cocoamine oxide, bis(2-hydroxyethyl) tallowamine oxide; and bis(2-hydroxyethyl) stearylamine oxide.

Further useful amine oxides include those which may be characterized as alkylamidopropyl di(lower alkyl) amine oxides in which the alkyl group has about 10-20, and preferably 12-16 carbon atoms, and can be straight or branched chain, saturated or unsaturated. Examples are cocoamidopropyl dimethyl amine oxide and tallowamidopropyl dimethyl amine oxide; and

Additional useful amine oxides include those which may be referred to as alkylmorpholine oxides in which the alkyl group has about 10-20, and preferably 12-16 carbon atoms, and can be straight or branched chain, saturated or unsaturated.

Useful amine oxides may be obtained from a variety of commercial sources and include for example amine oxides available in the AO series from Tomah Products Inc.; in the AMMONYX series

from Stepan Co.; in the BARLOX series from Lonza Inc. (Fairlawn, NJ), in the RHODAMOX series from Rhone-Poulenc Inc. (Cranbury, NJ), as well as in the MACKAMINE series of products from McIntyre Group Ltd.

Particularly useful amine oxides for use in the present inventive compositions include AO-728 Special which is described to be a composition containing 50%wt. of bis-(2-hydroxyethyl C12-C15 alkyloxypropyl) amine oxide (Tomah Products Inc., Milton WI), and AMMONYX CDO Special described to be cocoamidopropyl dimethyl amine (Stepan Co., Northfield IL).

When included in the concentrated liquid disinfectant compositions, the amine oxide constituent is present in amounts of from about 0.001 % by weight to up to about 30% by weight, preferably about 1-20% by weight, most preferably in amount of between 12-15 % by weight. Of course a mixture of these amine oxide constituents may be used.

A further botanical oil solubilizing constituent which may be included in the concentrate compositions are alkylpolyoxycarboxylates and alkylarylpolycarboxylates. Examplary alkylpolyoxycarboxylates and alkylarylpolycarboxylates include alkyl- and alkylaryl-carboxylates which include those which may be represented by the general formula:

$$R\text{-}COO^- M^+$$

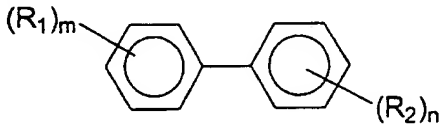
wherein R is a straight or branched hydrocarbon chain containing from about 9 to 21 carbon atoms, and which may also include an aromatic ring, especially a phenyl group as part of the hydrocarbon chain, and M is a metal or ammonium ion. Further preferred alkylpolyoxycarboxylates include polyethoxycarboxylates which may be represented by the general formula:

$$R\text{-}[\text{-}OCH_2CH_2\text{-}]_n\text{-}CH_2COO^- M^+$$

wherein R is a straight chained or branched hydrocarbon chain which may include an aryl moiety, but is desirably a straight chained or branched hydrocarbon chain; and n is an integer value of from 1 – 24, and M is a metal or ammonium ion, but is preferably a alkali or alkaline earth metal ion, especially sodium. Exemplary useful alkylpolyoxycarboxylates and alkylarylpolycarboxylates include those commercially available in the NEODOX series from Shell Chemical Co.; SANDOPAN series from Clariant Inc. (Charlotte, NC), as well as in the SURFINE series from Finetex, Inc.

When present in the concentrated liquid disinfectant compositions, the alkylpolyoxycarboxylates or alkylarylpolycarboxylate constituent is included in amounts of from about 0.001 % by weight to up to about 20% by weight, preferably about 0.1 - 10% by weight, most preferably in amount of between 1 - 5 % by weight. Of course a mixture of these constituents may be used. It is to be understood that the alkylpolyoxycarboxylates and alkylarylpolycarboxylates may be used in the place or, or in conjunction with the amine oxide constituent discussed herein. Also, mixtures of two or more alkylpolyoxycarboxylates and alkylarylpolycarboxylates may be used.

In certain compositions according to the invention, and in accordance with certain specific preferred embodiments, the compositions include a biphenyl solvent constituent, The alkyl biphenyl solvent is one which may be generally represented by the formula



wherein:

R_1 is hydrogen or is a lower alkyl radical, preferably a C_1-C_{10}, but more preferably is a C_1-C_6 straight chained or branched alkyl radical,

R_2 is a lower alkyl radical, preferably a C_1-C_{10}, but more preferably is a C_1-C_6 straight chained or branched alkyl radical,

m is an integer from 1 – 3 inclusive; and,

n is an integer from 1 – 3 inclusive.

Preferably R_1 is hydrogen, m is 1, and R_2 has any of the values indicated above.

More preferably, R_1 is hydrogen and m is 1, and R_2 is a C_1-C_6 straight chained or branched alkyl radical.

It is to be understood that mixtures of the compounds indicated above may be used as the biphenyl solvent constituent. Such alkyl biphenyls are, per se, known to the art, and are described in US 3787181. Particularly useful as the alkyl biphenyl solvent are materials presently marketed as NUSOLV ABP solvents (Ridge Technologies Inc., Ridgewood NJ) described to be a high purity alkyl biphenyls and mixtures thereof, and is also available from Koch Chemical Co. (Corpus Christi, TX).

When present in the inventive concentrate compositions, the biphenyl solvent is present in amounts of from about 0.001 % by weight to up to about 10% by weight, preferably about 0.1 - 5% by weight, most preferably in amount of between 0.5 - 2 % by weight. Of course a mixture of these biphenyl solvents may be used.

Water is added in order to provide 100% by weight of the concentrate composition. The water may be tap water, but is preferably distilled and/or deionized water. Water is added in amounts which are sufficient to form the concentrated compositions which amount is sufficient to ensure the retention of a substantially clear characteristic when produced as a concentrate, but at the same time ensuring good blooming upon the addition of the concentrated composition to a further amount of water, or upon the addition of further water to the concentrate.

Other conventional additives known to the art but not expressly enumerated here may also be included in the compositions according to the invention. By way of non-limiting example without limitation these may include : chelating agents, coloring agents, light stabilizers, fragrances, thickening agents, hydrotropes, pH adjusting agents, pH buffers as well as one or more detersive surfactant

constituents particularly non-ionic and amphoteric surfactants. Many of these materials are known to the art, per se. Such optional, i.e., non-essential constituents should be selected so to have little or no detrimental effect upon the desirable characteristics of the present invention, namely the blooming behavior, cleaning efficacy, disinfectant activity, and low toxicity as provided by the inventive compositions. Generally the total weight of such further conventional additives may comprise up to 20% by weight of a concentrated composition formulation.

Exemplary useful buffers include the alkali metal phosphates, polyphospates, pyrophosphates, triphosphates, tetraphosphates, silicates, metasilicates, polysilicates, carbonates, hydroxides, and mixtures of the same. Certain salts, such as the alkaline earth phosphates, carbonates, hydroxides, can also function as buffers. It may also be suitable to use buffers such materials as aluminosilicates (zeolites), borates, aluminates and certain organic materials such as gluconates, succinates, maleates, and their alkali metal salts. Such buffers keep the pH ranges of the compositions of the present invention within acceptable limits.

Exemplary useful pH adjusting agents include known materials which may be used to adjust the pH of the concentrate compositions to a desired range.

The useful optional nonionic surfactants, include known art nonionic surfactant compounds. Practically any hydrophobic compound having a carboxy, hydroxy, amido, or amino group with a free hydrogen attached to the nitrogen can be condensed with ethylene oxide or with the polyhydration product thereof, polyethylene glycol, to form a water soluble nonionic surfactant compound. Further, the length of the polyethylenoxy hydrophobic and hydrophilic elements may various. Exemplary nonionic compounds include the polyoxyethylene ethers of alkyl aromatic hydroxy compounds, e.g., alkylated polyoxyethylene phenols, polyoxyethylene ethers of long chain aliphatic alcohols, the polyoxyethylene ethers of hydrophobic propylene oxide polymers, and the higher alkyl amine oxides.

To be mentioned as particularly useful nonionic surfactants are alkoxylated linear primary and secondary alcohols such as those commercially available under the tradenames POLYTERGENT SL series (Olin Chemical Co., Stamford CT), NEODOL series (Shell Chemical Co., Houston TX); as alkoxylated alkyl phenols including those commercially available under the tradename TRITON X series (Union Carbide Chem. Co., Danbury CT).

Further exemplary useful nonionic surfactants which may be used include certain alkanolamides including monoethanolamides and diethanolamides, particularly fatty monoalkanolamides and fatty dialkanolamides. Commercially available monoethanol amides and diethanol amides include those marketed under the trade names ALKAMIDE and CYCLOMIDE by Rhône-Poulenc Co., (Cranbury, NJ).

Exemplary useful amphoteric surfactants include alkylbetaines, particularly those which may be represented by the following structural formula:

$$RN(CH_3)_2CH_2COO^-$$

wherein R is a straight or branched hydrocarbon chain which may include an aryl moiety, but is preferably a straight hydrocarbon chain containing from about 6 to 30 carbon atoms. Further exemplary useful amphoteric surfactants include amidoalkylbetaines, such as amidopropylbetaines which may be represented by the following structural formula:

$$RCONHCH_2CH_2CH_2N^+(CH_3)_2CH_2COO^-$$

wherein R is a straight or branched hydrocarbon chain which may include an aryl moiety, but is preferably a straight hydrocarbon chain containing from about 6 to 30 carbon atoms.

Particularly exemplary useful betaines include dodecyl dimethyl betaine, cetyl dimethyl betaine, dodecyl amidopropyldimethyl betaine, tetradecyldimethyl betaine, tetradecylamidopropyldimethyl betaine, and dodecyldimethylammonium hexanoate. What is to be understood by the term "concentrate" and "concentrate composition" in this specification and claims is the form of the product prepared for sale to the consumer or other end user. Such a consumer or other end user would then normally be expected to dilute the same with water to form a cleaning composition. Similarly, what is to be understood by the term "cleaning compositions" are the water diluted compositions which are expected to be prepared by the consumer or other end user by mixing a measured amount of the "concentrate" with water in order to form an appropriately diluted cleaning composition which is suitable for use in cleaning applications, especially in the cleaning of hard surfaces.

It is also to be understood, that proportions of one or more constituents have been and generally are referred to as percent by weight or as parts by weight based on a measure of 100 % by weight, unless otherwise indicated.

According to certain particularly preferred embodiments of the invention there are provided aqueous concentrated liquid disinfectant composition which comprise (and in particularly preferred embodiments, consist essentially of) the following constituents:

1 - 10%wt. of botanical oil constituent;

0.5 - 6%wt. of a germicide, preferably a quaternary ammonium compound having germicidal properties;

0.1 - 35%wt. of an organic solvent constituent;

1 - 20%wt. of a botanical oil solubilizing constituent;

1 - 5%wt. of an amine oxide, alkylpolyoxycarboxylate or alkylarylpolyoxycarboxylate;

optionally but desirably up to 20%wt. of at least one optional constituent selected from: chelating agents, coloring agent, light stabilizers, fragrances, thickening agents, hydrotropes, pH adjusting agents, pH buffers one or more detersive surfactant constituents particularly non-ionic and amphoteric surfactants other than the amine oxides, alkylpolyoxycarboxylates or alkylarylpolyoxycarboxylates, as well as others known the art, with the proviso that the concentrate compositions do not include significant amounts of

pine oil, i.e., less than 1%wt., preferably not more than 0.5%wt, but most preferably not more thant 0.1%wt. Most desirably, the compositions are essentially free of pine oil.

According to certain particularly preferred embodiments, the concentrate compositions also include a biphenyl solvent in the preferred amounts indicated above.

As noted, the concentrate may be used without dilution, i.e., in concentrate:water concentrations of 1:0, to extremely dilute dilutions such as 1:10,000. Desirably, the concentrate is diluted in the range of 1:0.1 - 1:1000, preferably in the range of 1:1 - 1:500 but most preferably in the range of 1:10 - 1:100. The actual dilution selected is in part determinable by the degree and amount of dirt and grime to be removed from a surface(s), the amount of mechanical force imparted to remove the same, as well as the observed efficacy of a particular dilution.

In accordance with preferred embodiments of the invention, when a quantity of the concentrate compositions taught herein are added to a larger volume of water, a blooming characteristic is manifested. While "blooming" may be broadly characterized as the formation of milky, creamy or cloudy appearance which is manifested when a dilutable composition is added to a larger volume or quantity of water, it may be alternately characterized as the reduction of transmitted light through an amount of water by at least 30%, desirably by at least 40%, yet more desirably by at least about 50%, and yet most desirably by at least 60% or more when a dilution of the concentrate composition:water with the weight or volume ratio range of from 1:64 - 102 is formed at a water temperature of about 20°C. That such blooming may be attained without the use of pine oil such is are commonly found in certain commercially available pine oil containing preparations is very surprising. Concentrate compositions according to preferred embodiments of the invention exhibit a long lasting blooming effect when they are diluted into a larger volume of water, especially when used to form (weight ratio) dilutions with water of concentrate:water of 1:64 at room temperature. Desirably, such dilutions do not exhibit an increase in light transmittance in accordance with the measurement methods discussed in the Examples below, of more than 50% (based on the initial 'as mixed' value) during its initial three-day interval.

The concentrate compositions according to the invention, and aqueous dilutions formed therefrom, are particularly useful in the sanitization of hard surfaces. Hard surfaces which are to be particularly denoted include those associated with kitchen environments, lavatory environments, especially flooring surfaces and the surfaces of fixtures (doors, cabinets, shelving, and the like) in such environments.

The compositions according to the invention exhibit sanitizing properties, and are useful in the sanitization of surfaces wherein the presence of various viruses, molds, fungi, bacteria, and mildew are suspected.

In preferred embodiments, aqueous dilutions of the concentrated aqueous liquid disinfectant compositions exhibit antimicrobial efficacy against at least one, preferably against at least two, but most preferably against at least three of the following bacteria: *Staphylococcus aureus*, *Salmonella choleraesuis*,

Pseudomonas aeruginosa, where the ratio of concentrate composition:water is 1:64 to 1:102. Such dilution ratios of concentrate:water as described above may be volume/volume basis, or a weight/weight basis.

The following examples below illustrate exemplary and among them preferred formulations of the composition according to the instant invention.

Examples

A number of formulations were produced by mixing the constituents outlined in Table 1 by adding the individual constituents into a beaker of deionized water at room temperature which was stirred with a conventional magnetic stirring rod. The order of addition is not critical, but good results are obtained where the surfactants are added to the water prior to the other constituents. The exact compositions of the example formulations are listed on Table 1, below. Attention is directed to the fact that the formulations in Table 1 were substantially the same, except for the types and amounts of acids which were included in the formulations.

Table 1

	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5
lavender oil	8.0	–	–	–	–
peppermint oil	–	8.0	8.0	8.0	8.15
quaternary ammonium compound (80%)	8.0	8.0	0.5	0.5	7.85
isopropyl alcohol	12.0	12.0	12.0	12.0	12.0
propylene glycol	20.0	20.0	20.0	20.0	20.0
lauryl alcohol	1.0	1.0	1.0	1.0	1.0
biphenyl solvent	1.0	1.0	1.0	1.0	1.0
amine oxide (50%)	–	–	14.0	14.0	–
alkylpolyoxycarboxlate	–	–	0.5	–	1.0
Na2EDTA	0.5	0.5	–	–	–
EDTA	–	–	0.5	0.5	0.5
di water	to 100	to 100	to 100	to 100	to 100

The identity of the specific constituents used to produce the formulations according to Table 1 are listed on Table 2, below:

Table 2	
lavender oil	(Berje Co., Bloomfield, NJ)
peppermint oil	(Berje Co., Bloomfield, NJ)
quaternary ammonium compound (80%)	BTC 8358, alkyl dimethyl benzyl ammonium chloride (Stepan Corp, Northfield, IL), 80%wt. actives
isopropyl alcohol	technical grade, 100% wt. (Eastman Chemical Corp.)
propylene glycol	technical grade, 100% wt. (Eastman Chemical Corp.)
lauryl alcohol	technical grade mixture of 65-75%wt. 1-dodecanol, 22-28%wt. 1-tetradecanol, 4-8%wt. 1-hexadecanol, and 0-0.5%wt. 1-decanol (Henkel Corp.)
biphenyl solvent	NUSOLV ABP-103 (Ridge Technologies Inc., Ridgewood NJ)
amine oxide (50%)	TOMAH AO-728 special was bis-(2-hydroxyethyl C12-C15 alkyloxypropyl) amine oxide (Tomah Products Inc., Milton WI), 50%wt. actives
alkylpolyoxycarboxlate	carboxlated alcohol, as EMCOL CNP 110 (Witco Chem. Co.), 100%wt. actives
Na2EDTA	disodium salt of ethylenediamine tetraacetic acid, sold as VERSENE Na2 crystal (Dow Chem. Co.)
EDTA	ethylenediaminetetraacetic acid, sold as VERSENE Acid (Dow Chem. Co.)
di water	deionized water

All of the formulations on Table 1 indicated in weight percent, and the percent actives of individual constituents are 100% unless otherwise indicated.

The blooming characteristics of these formulations was characterized by using the Brinkman Sybron PC 801 colorimeter. Each tested formulation were diluted with deionised water in a weight ratio of 1:64, and the test was carried out with each of the formulations and water at room temperature (68°F, 20°C). The resulting determined values, reported as "blooming" in the following table provide an empirical evaluation in percent transmittance (%) of the degree of transparency of a diluted example formulation wherein 0% indicates complete opacity and 100% the transparency of a deionised water sample. The result was tabulated on Table 3 :

Table 3	
	% Transmittance
Comp.1	0.5
Ex.1	8.1
Ex.2	7.6
Ex.3	1.6
Ex.4	1.5
Ex.5	7.9

Comparative 1 (Comp.1) was DETTOL (Reckitt & Colman PLC, Hull, UK), a soap based, blooming type disinfecting concentrate composition which does not include biphenyl solvents. DETTOL has a particularly substantive bloom and is used as a 'benchmark' for other formulations.

As may be seen from the results indicated on Table 3, the formulations according to the invention based on the botanical oil constituent provided very satisfactory blooming.

Cleaning Test:

Cleaning efficacy was measured for weight ratios of 1:64 (concentrate composition:water) aqueous dilutions of formulations according to Ex.1 and Ex.2 and as a control, the formulation according to Comp.1 described above. The test was carried out using the ASTM D4488-89, Annex A2 method - greasy soil on painted masonite wallboard test, using a Gardner Washability Apparatus.

Latex painted masonite wallboard is soiled with a mixture of melted, oily soils containing a small amount of carbon black and allowed to set overnight. A first aqueous dilution is applied to a sponge that scrubs half the soiled substrate in a straight-line using the Gardner Washability Apparatus. Afterwards, the second aqueous dilution is applied to a further sponge that scrubs the other half of the soiled substrate in a similar manner.

In determining the cleaning efficiency, reflectance values were determined using a Gardner Lab Scan Reflectometer for each of the following: a clean unsoiled panel. a soiled panel, and a soiled panel following Gardner Washability Apparatus scrubbing. Such reflectance values were then employed to calculate % cleaning efficiency according to the following formula:

$$\% \text{ Cleaning Efficiency} = \frac{Lt - Ls}{Lo - Ls} \times 100\%$$

wherein,

Lt = % reflectance average after scrubbing solid tile

Ls = % reflectance average before cleaning soiled tile

Lo = % reflectance average original tile before soiling

Cleaning efficiency results for Formulation 1 are shown in TABLE 4, hereinafter.

Table 4

Formulation:water (1:64) w/w dilution	% Cleaning Efficiency
DETTOL	42.8
Ex.1	44.6
Ex.2	43.9

As a comparative example, a dilution was also formed from DETTOL, described above.

As shown, the measurement of the cleaning effectiveness of the test samples involved the ability of the cleaning composition to remove the test soil from the test substrate. This was expressed by % Cleaning Efficiency. As numerical values for a % Cleaning Efficiency increase, higher cleaning effectiveness is achieved for the cleaning composition tested. As the results show, the inventive composition showed an excellent cleaning property.

Antimicrobial Evaluation:

A modified European suspension test was carried out for formulations according to Examples 1 and 2 described above and as a comparative example, DETTOL (Reckitt & Colman PLC, England) a concentrated cleaning and disinfecting composition described previously. The method is summarized as follow.

1) Pipette 8 ml of the test product dilution into sterile medicant tube and held at 20C + 1C in water bath.

2) In another sterile medicant tube pipette 1.0 ml of adjusted culture and 1.0 ml of prepared Bovine Albumin Solution and held at 20C + 1C in water bath.

3) At time =0 minute, add product solution into medicant tube containing a mixture of Bovine Albumin Solution and culture suspension of each test organism. This mixture results in a final dilution of the test product, a concentration of 0.03% of Bovine Albumin Solution and bacterial count of at least 1-3 x 10^7 CFU/ml.

4) At time =5 minutes, pipette 1 ml of this mixture into 9 ml of neutralizing solution (letheen broth) so as to achieve 1:10 dilution. Prepare serial dilution in Letheen broth and place with Tryticase soy with lecithin and Tween 80 agar in duplicate.

Control: The procedure as outlined above was repeated, using 8 ml of sterile water instead of product dilution for each test organism.

To pass the test method, it was required that the tested formulations satisfied a 5 log reduction in reference bacterial strain of *S.aureus* (ATTC #5438), *Ps.aeruginosa* (ATTC #15442), *Escherichia coli* (ATTC #10536), with 5 minutes contact time at 20°C + 1°C under the defined testing method. It was found that each of the formulations according to Ex.1 and Ex.2 showed reduction of the test organisms at the testing contact time. The testing requirements indicate a (great than) ">5" log reduction within 5 minutes. It was concluded that formulations according to Ex. 1 and 2 have at least the same microbial activity as DETTOL.

Claims:

1. An aqueous concentrated liquid disinfectant composition which blooms when added to a larger volume of water which comprises the following constituents:
botanical oil constituent;
a germicidal cationic surfactant, and most preferably a quaternary ammonium compound having germicidal properties;
organic solvent constituent;
at least one botanical oil solubilizing surfactant, preferably selected from amine oxides, alkylpolyoxycarboxylates and alkylarylpolyoxycarboxylates;
optionally but desirably at least one optional constituent selected from: chelating agents, coloring agents, light stabilizers, fragrances, thickening agents, hydrotropes, pH adjusting agents, pH buffers one or more detersive surfactant constituents particularly non-ionic and amphoteric surfactants,

2. The composition according to claim 1 wherein the botanical oil constituent is selected from lavender oil and peppermint oil.

3. The composition according to claim 1 wherein the germicidal cationic surfactant is a quaternary ammonium compound having germicidal properties.

4. The composition according to claim 1 wherein the organic solvent constituent is selected from isopropyl alcohol, lauryl alcohol, propylene glycol.

5. The composition according to claim 1 wherein the botanical oil solubilizing surfactant is an amine oxide.

6. The composition according to claim 1 wherein the botanical oil solubilizing surfactant is an alkylpolyoxycarboxylates.

7. The composition according to claim 1 wherein the botanical oil solubilizing surfactant is an alkylarylpolyoxycarboxylates.

8. An aqueous dilution of the composition according to claim 1 in a larger volume of water.

9. A process for the cleaning of hard surfaces which comprises the process step of:
applying a cleaning effective amount of the composition according to claim 1 to a hard surface.

10. A process for the sanitization of hard surfaces which comprises the process step of:
applying a sanitizing effective amount of the composition according to claim 1 to a hard surface

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Application No: GB 9907212.6
Claims searched: 1 to 10

Examiner: Michael Conlon
Date of search: 25 June 1999

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): C5D (DHX, DHZ, DJX, D161, D162, D163)

Int Cl (Ed.6): C11D 3/00

Other: Online: WPI, CLAIMS

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	WO97/18285 A1	(Reckitt & Colman) claim 1 and the Examples	1, 8, 9, 10
X	WO97/06230 A1	(Reckitt & Colman) Table 1B	1, 8, 9, 10
X	US5629280	(Richter) Table 1	1, 8, 9, 10
X	US5610189	(Whiteley) Table 1	1, 8, 9, 10
X	US5591708	(Richter) Table 1	1, 8, 9, 10
X	US4597887	(Colodney) Example 1	1, 8, 9, 10
X	US4455250	(Frazier) column 2 lines 61-68	1, 8, 9, 10
X	US4336151	(Like) Example 2	1, 8, 9, 10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.